

# Artificial Intelligence Stimulus Response System

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## Abstract

The Stimulus Response System (SRS) is based on the concept of artificial intelligence (AI) based mark-up language. (AIML) and is used to train the system for recognizing the user input. By making use of the previously built knowledge base this system is trying to analyze the user input and it provides the response. The Chatter Bot's, reported in the literature, and was used mainly the indexing technique. The method is strongly dependent on the contents that are stored in a file or a database. Thus there is a need to develop a new system that allows you to carry on conversations with the system as long as possible.

Stimulus Response System creates and adds knowledge to a computer. As a result, the computer will appear as human. The main objective of the work is to design an interactive software package which make the computer simple by building content that induces the client to carry on interactive conversations with the system as long as possible.

**Keywords:** *SRS, AIML, AI, Stimulus, Markup Language.*

## 1. Introduction

The internal or external change that causes a RESPONSE is called a STIMULUS. A conversation is an assimilation of information where one creates differences and similarities during the duration of a conversation. Depending on the level of intelligence the experience would be enjoyable and a true emulation of a virtual entity [1-2]. The gradient of intelligence is not the number of correct and incorrect statements but the ability to learn and add to its knowledge base. To create a more user accessible chat system; a simpler output method using voice is introduced; creating and catering for a more personal and convenient experience.

Web-bots were created as text based web-friends, an entertainer for a user. Furthermore, and separately there already exists enhanced Rich Site Summary (RSS) feeds and expert content processing systems that are accessible to web users. [3] Text-based web-bots can be linked to function beyond an entertainer as an informer, if linked with, amongst others, RSS feeds or expert systems [4]. Such a friendly bot could function as a trainer providing realistic and up-to-date responses.

A chatbot (Chatterbot) is a computer program designed to simulate an intelligent conversation with one or more human users via auditory or textual methods. Traditionally, the aim of such simulation has been to fool the user into thinking that the program's output has been produced by a human (the Turing test). Programs playing this role are sometimes referred to as Artificial Conversational Entities, talk bots or chatterboxes. More recently, however, Chabot-like methods have been used for practical purposes such

as online help, personalized service, or information acquisition [5-12], in which case the program is functioning as a type of conversational agent. What distinguishes a Chabot from more sophisticated natural language processing systems is the simplicity of the algorithms used.[13-25]. Although many Chabot's do appear to interpret human input intelligently when generating their responses, many simple scan for keywords within the input and pull a reply with the most matching keywords, or the most similar wording pattern, from a textual database[26-30]. Making the system to act as human being who can think, learn and remember by providing user friendly artificial intelligence (AI)[31-32]. The main scope of the study is to make the system

- To provide intelligent response based on the user queries.
- To remember the user queries along with personalization.
- To give response based on the topic they are talking by remembering.
- To learn with the help of interactions.

## 2. Related Work

Analyzing chatterbot development from the viewpoint of NLP, we can identify three generations of these systems[17]:

- The first generation was based on simple techniques of pattern matching (e.g., ELIZA) ;
- The second generation includes techniques of Artificial Intelligence
- The third generation uses more sophisticated pattern matching techniques, based on XML (eXtensible Markup Language).

Of the three generations of chatter bots just mentioned, we would like to call attention to the third, because its systems present a more complete architecture from the point of view of NLP, and equal or superior performance to the systems of the other generations is AIML.

A vast number of the third generation chatter bots are based on AIML, a markup language for chatter bot construction which is based on XML. Systems based on AIML count on a dialogue base of categories formed of units. However, despite their evident success, the third generation chatters bots still present limitations in the way they interpret and generate sentences in natural language. To check these limitations, The scientists investigated the performance of these chatter bots from the computational point of view (comparing them to other NLP systems) as well as from the conversational point of view, in which they explored principles to verify the functional limitations of these systems. The analysis revealed three recurring problems in these chatter bots:

(1) They fail to take into account the global course – structure of a conversation (opening, development, and closing) and may accept, for example, morphological structure, therefore, they do not consider *hi* and *hello* as repeated sentences;

(3) Many sentences are treated as unknown when in fact they are adjacent turns expected from a sociocultural point. Greetings that are typical in openings to appear in the development or in the closing phase;

(2) These systems treat the user's sentences based on their syntactic constructs.

### 2.1 Machine learning chatbot

Abu Shawar, B., Atwell, E.[16] used corpora in machine- learning chatbot systems. A chatbot is a machine conversation system which interacts with human users via natural conversational language. Software to machine-learn conversational patterns from a transcribed dialogue corpus has been used to

generate a range of chatbots speaking various languages and sublanguages including varieties of English, as well as French, Arabic and Afrikaans. This paper presents a program to learn from spoken transcripts of the Dialogue Diversity Corpus of English, the Minnesota French Corpus, the Corpus of Spoken Afrikaans, the Qur'an Arabic-English parallel corpus, and the British National Corpus of English; we discuss the problems which arose during learning and testing. Two main goals were achieved from the automation process. One was the ability to generate different versions of the chatbot in different languages, bringing chatbot technology to languages with few if any NLP resources: the corpus-based learning techniques transferred straightforwardly to develop chatbots for Afrikaans and Qur'anic Arabic. The second achievement was the ability to learn a very large number of categories within a short time, saving effort and errors in doing such work manually: we generated more than one million AIML categories or conversation-rules from the BNC corpus, 20 times the size of existing AIML rule-sets, and probably the biggest AI Knowledge-Base ever.

## 2.2 T-Bot and Q-Bot

Mikic, F.A., Burguillo, J.C., Rodríguez, D.A., Rodríguez, E., Llamas, M.[17] developed a couple of AIML-based Bots for tutoring courses and evaluating students. Intelligent Tutoring Systems are computer programs that aim at providing Personalized instruction to students. In recent years, conversational robots, usually known as chatterbots, become very popular in the Internet, and ALICE (Artificial Linguistic Internet Computer Entity) is probably the most popular one. ALICE brain is written in AIML (Artificial Intelligence Markup Language), an open XML language. We consider the combination of approaches, i. e., and the use of AIML-based bots for tutoring purposes in open e-Learning platforms like Claroline or Moodle. With that aim in mind, we have developed two different bots for helping the students during the learning process and for supporting the teaching activities of the professor. One of them is a tutor bot (T-Bot), and is able to analyse the requests made by the learners in written natural language and to provide adequate and domain specific answers orienting the student to the right course contents. The other one is an evaluation bot (Q-Bot), and is oriented to track and supervise the student progress by means of personalized questionnaires.

## 2.3 IVFAS

An Intelligent Virtual Financial Advisor System was proposed by Sing, G.O., Sahib, S. Elangsegaran, R.[18] Applications on the WWW and Expert Systems have been mushrooming since 1980. Stimulated by the revolution in networking and intelligent in high-level web-based programming languages, intelligent WWW systems become popular in the 21<sup>st</sup> century. This allows human to enjoy a better lifestyle and improve their standard of living. Meanwhile its cost effectiveness has to be maintained. Intelligent Virtual Financial Advisor System will be one of these applications which proposed to provide the professional financial advice to all level of users facilitated by the advance networking technology such as Internet, internet networking and Intranet. In this paper, agent-based approach and integration Artificial Intelligent Neural-Network Identity (AINI) chatterbots are proposed for the development of IVFAS. Applying these technologies into IVFAS will promote a better Human-Computer Interaction environment between the users and the system. This research is in collaboration with Maybank Sdn Bhd., the biggest financial institution in Malaysia which is a pioneer in online banking.

## 2.4 Personality Importance

The idea of adding personality to chatterbots using the Persona-AIML architecture is suggested by Galvão, A.M., Barros, F.A., Neves, A.M.M., Ramalho, G.L. [19] Recent studies highlight the importance of personality for improving human- machine interaction. Attempts of including personality in chatterbots have not been satisfactory regarding the coherence of the chatterbot's behavior, the flexibility and reusability of the personality model. This work presents Persona-AIML, an original architecture for the creation of chatterbots in AIML with personality. It is a flexible architecture that allows the use of different models of personality, described in terms of five elements: traits, attitudes, mood, emotions and physical states. Recent experiments validate the reusability and extensibility of our architecture to build chatterbots with different personalities, however using the same categories base.

## 2.5 CHARLIE

Charlie is an aiml based chatterbot which presented by Mikic, F.A. Burguillo, J.C. Llamas, M., Rodríguez, D.A., Rodríguez, E [20]. and it works as an interface among INES and humans. INES (INtelligent Educational System) is a functional prototype of an online learning platform, which combines three essential capabilities related to e-learning activities. These capabilities are those concerning to a LMS (Learning Management System), a LCMS (Learning Content Management System), and an ITS (Intelligent Tutoring System). To carry out all this functionalities, our system, as a whole, comprises a set of different tools and technologies, as follows: semantic managing users (administrators, teachers, students...) and contents tools, an intelligent chatterbot able to communicate with students in natural language, an intelligent agent based on BDI (Believes, Desires, Intentions) technology that acts as the brain of the system, an inference engine based on JESS (a rule engine for the Java platform) and ontologies (to modelate the user, his/her activities, and the learning contents) that contribute with the semantics of the system, etc. At the present paper we will focus on the chatterbot, CHARLIE (CHAtteR Learning Interface Entity), developed and used in the platform, which is an AIML-based bot.

## 2.6 Persona-AIML

This work presents the Persona-AIML architecture for the creation of chatterbots in AIML with personality by Galvão, A.M., Barros, F.A., Neves, A.M.M., Ramalho, G.L.[21] It is a flexible architecture that allows the use of different models of personality in the construction of chatterbots. Tests with the prototype revealed satisfactory and very encouraging results.

## 2.7 XbotML

Since 1995, a new paradigm for the construction of chatterbots based on markup languages has emerged. The most prominent of these languages is AIML. Despite its success, XML chatterbots have drawbacks in what concerns the level of fluency in dialogues. We present here XbotML, a new language for the construction of chatterbots based on principles of the Conversational Analysis theory. Following this theory, XbotML structures dialogues between user and chatterbot in adjacency pairs, each pair bearing one associated intention. As proof of concept, Neves, A.M.M., Barros, F.A.[22] constructed a chatterbot that has reached fluency level around 75% in dialogues with people. This is an original work that contributes to raise the fluency level of XML chatterbots by: providing a linguistically grounded

model for chatterbot’s markup languages bases; providing a modular model for these bases; and allowing the extension of existing bases to different domains and applications

### 2.8 RMRSBot

This paper was about the usage of linguistic information to enrich a chatbot Klüwer, T.[23] Coming to open domain dialog it is still unrealistic to implement needed knowledge resources and dialog skills linguistically. Since the Non Player Characters (NPC) in our NPC Engine should be capable of open conversation we decided to use an Artificial Intelligence Markup Language (AIML) chatbot as a first workaround. However AIML chatbots are not linguistically motivated, they use surface structures in tradition of Weizenbaums ELIZA, wherefore they do have too many shortcomings to use them in real dialog applications. One of the major problems is the handling of surface variation. To be able to process one sentence with different structures, they need as much patterns as there are syntactic alternatives, which lead to an exploding number of pattern template pairs. To reduce the costs of the manual development, AIML authors use simple regular expression operators, what in turn leads to the problem of being overly permissive. A possibility to abstract from the surface level and still be able to control the structure is to use information from syntactic and semantic analysis. In the presented system two scenarios were implemented: 1. Using part of speech information and 2. Using the results from a semantic analysis.

### 3. DESIGN METHODOLOGY

This system is designed to provide service to the user related queries. The developed system includes a mechanism to treat intentional information based on AIML, a state-of-the-art technology in chatterbox development. Our main goal was to improve dialogues with AIML chatter bots. AIML adds structure to AIML bases, incorporating intentions and rules used in sentence interpretation and generation. We adopted as linguistic base the Conversational Analysis Theory (CAT), which considers intentionality in adjacent pairs in dialogue, facilitating the establishment of consistent dialogues between chatter bots and users. Tests with the implemented solution showed feasibility of the proposed approach.

- Gives intelligent response based on the user queries
- It remembers the user queries and along with the personalization.
- It also remembers on which topic they are talking based on that it gives response.
- It can learn.

The overall system design of a Stimulus Response System consists of 3 main parts is as shown in Figure 1

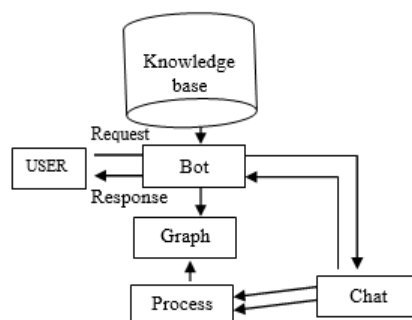


Figure 1 Over All System Design

- **Input text:** where you are going to write what you want to say to your chat bot.
- **Ask button:** so you can send your input to be analysed before getting the output.
- **Output text:** where your chat bot is going to give a response.

The most important part is the sending button as it contains all the processes which analyse your input before copying the result to the output, so I will call the sending button the Artificial Intelligence Base (AI Base).

## 4. IMPLEMENTATION

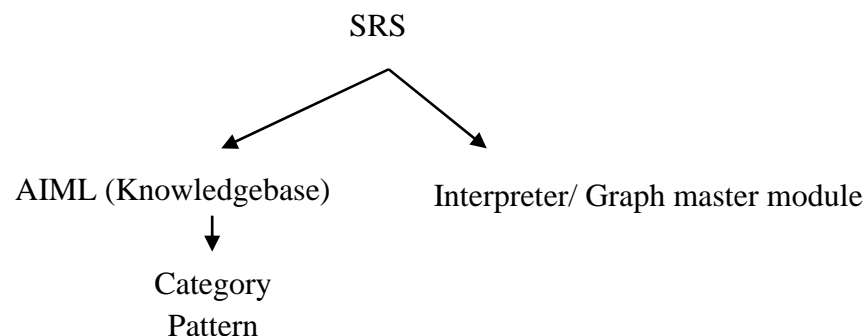
The Stimulus Response System consists of three main modules. The modules are as follows and is shown in Figure 2

- Bot Module
- AIML Tag handler
- Interpreter or Graph Master module

**Bot module:** - This module is used to check local and global settings from XML files to load AIML files or reference objects in order to load the configuration settings. The utility class for loading AIML files from disk into the graph master structure that forms an AIML bot's brain.

**AIML Tag handler:-** This module provides information about the class that holds references to the assemblies that hold the custom tag handling code. AIML, or Artificial Intelligence Mark-up Language enables people to input knowledge into chat based on the AI software technology.

**Tree Construction/ Graph Master:** - The job of this module is to load the xml files and then by using LoadAiml function checks for the existence of directories if the arguments passed is a pathname. Otherwise it has to handle exceptions. Loads the Aiml from files found in the bot's AimlPath into the bot's brain.



**Figure 2. Modules of SRS**

It process aiml files and by using Add Category method it insert child to the root node. While processing, if it finds the category tag it has to process the topic which is above the category. If you don't have a topic tag directly places the pattern & templates.

#### 4.1 Procedure for processing user input

Whenever a raw input received from a user bot will processes the request and creates a response. The following steps are involved in processing the input:

Step 1: Normalize the input

Step 2: Grab the splitters and performs splitting job.

Step 3: Grab the templates for various sentences from the graph master.

Step 4: Call the Aiml tag handler to process the templates into appropriate output.

Exception handling

Else provide response

#### Class Management System

The pre-loading of libraries allows for streamlined operation the user is prompted to accept a signature, upon such an acceptance; the Classes can securely communicate to the web service. By using the Visual Studio development environment, the Classes and the libraries can be digitally signed. This allows the Classes to communicate with a web service not located on its source web server. The chat client is interrupt driven and activates upon interaction from a user. This is shown in Figure 3 where the control unit decides what component to launch next and what function to process. The action listener is bound to the buttons (login, and chat) which is included in the graphical userinterface (GUI).

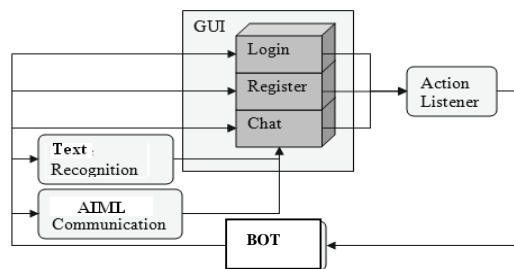


Figure 3: Chat Client

#### 5. CONCLUSION AND FUTURE ENHANCEMENT

The main contribution of this work is to allow user of artificial intelligence entitles to enrich the learning process and interaction with the system. Stimulus Response System is a simple and feasible solution to process natural language. The system has different modules which help to use this framework that will work upon different environments.

Stimulus Response System is a tool capable of answering user request using natural language. It provides users a new way to look for information as well as it guides through the platform resources while keeping a coherent dialogue.

Stimulus Response System has proved itself as a valuable tool. It allows users to observe their progress inside and evaluate the quality of the questions provided, always using natural language. Beside questions' level is always adapted to the user level.

No one has yet discovered the true potential of virtual personalities and AI, and our mission is to design tools which will help Bots to achieve greater relevance in both the commercial and personal sectors. Capabilities such as voice recognition, text to speech synthesis, invoking programs on remote or local

machines, content development tools, e-commerce and cartoon animations are under development to help you bring your bot to virtual life. Stimulus Response System will be adding more services in the future. We expect future services to be compatible with the sectors.

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